

REMARKS

Please reconsider the application in view of the above amendments and the following remarks. Applicants thank the Examiner for carefully considering this application.

Disposition of Claims

Claims 1-3 and 14-19 are pending in this application. Claim 17 is withdrawn from consideration. Claim 1 is independent. The remaining claims depend, directly or indirectly, from claim 1.

Claim 1 is amended in this reply to clarify that the ball screw nut is displaced only in a rotational direction, in accordance with the elastic deformation of the elastic member. Claim 1 has also been amended to clarify the nature of the elastic member. No new matter has been added by way of these amendments, which have been made for clarification purposes only. Support for these amendments may be found at least on p. 4, ll. 6-12, p. 5, l. 27 – p. 6, l. 7, and in the original claim 1.

Newly added claims 20-23 further clarify various embodiments of the invention. No new matter has been added by way of these additional claims. Support for the new claims may be found at least in Figs. 2, 6, 7, and 11, as well as in the specification at p. 10, l. 12 – p. 11, l. 4, and p. 30, ll. 8-23.

Rejection(s) under 35 U.S.C § 112

Claims 1-3, 14-16, 18, and 19 stand rejected under 35 U.S.C. § 112 as failing to comply with the enablement requirement. Claim 1 has been amended in this reply to

clarify the present invention recited. To the extent that this rejection may still apply to the amended claims, the rejection is respectfully traversed.

As stated in the original specification at p. 13, ll. 2-18 and in Fig. 2, the ball screw nut 29 has an internal helical screw groove 29b which forms a rolling path facing the external screw groove 22a formed in a left side portion of the rack shaft 22, wherein a plurality of balls 30 are accommodated in the rolling path. The balls 30 are used to reduce the frictional force generated when the ball screw nut 29 and rack shaft 22 relatively rotate. Although the ball screw nut 29 is supported, such as by an angular contact type ball bearing 25 as to be rotatable within the housing 8, and the pinion shaft 7 may be supported to some extent by the housing 8 and even possibly the rack shaft 22, the rack shaft 22 itself need not be supported by more than the ball screw nut 29. Applicants believe that the embodiments disclosed in Figs. 1-2 and the accompanying descriptions sufficiently enable one skilled in the art to make a power steering assembly in which the rack shaft 22 is entirely supported by the ball screw nut 29 and intermediately placed balls 30. Accordingly, withdrawal of this rejection is respectfully requested.

Claims 1-3, 14-16, 18, and 19 stand rejected under 35 U.S.C. § 112 as being indefinite. Claim 1 has been amended in this reply to clarify the present invention recited. To the extent that this rejection may still apply to the amended claims, the rejection is respectfully traversed.

As previously discussed with respect to the enablement rejection, Applicants believe that the application and figures support the claimed embodiment in which the

rack shaft 22 is entirely supported by the ball screw nut 29. Although other components such as the pinion shaft 7 may themselves require support, such as by the housing 8 or rack shaft 22, Applicants fail to discern a basis for the Examiner's statement that the rack shaft 22 would require further support beyond that provided by the ball screw nut 29. This configuration, as previously discussed, is fully supported by the specification and figures (at least in Figs. 1-2 and the accompanying descriptions). Accordingly, withdrawal of this rejection is respectfully requested.

Claim 1 also stands rejected under 35 U.S.C. § 112 as being vague and indefinite due to the language "elastic member deforming." Claim 1 has been amended in this reply to clarify this limitation. Accordingly, withdrawal of this rejection is respectfully requested.

Rejection under 35 U.S.C § 102

Claims 1-3, 14, 16, 18 and 19 stand rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 5,971,094, issued to Joshita ("Joshita"). Claim 1 has been amended in this reply to clarify the present invention recited. To the extent that this rejection may still apply to the amended claims, it is respectfully traversed.

Claim 1, as amended, recites a power steering apparatus comprising, among other components, a ball screw shaft that is entirely supported by a ball screw nut. The ball screw nut is rotationally displaced by the *rotational elastic deformation* of an elastic member that is operatively connected to a motor. Such a configuration will not only absorb an impact, but will advantageously limit the radial displacement of the ball screw

shaft due to an impact.

In contrast to the embodiment of claim 1, Joshita discloses an elastic member (50) disposed between a nut (10) and a rotor (8e) that is able to displace in a radial direction, but *is not able to displace in a rotational direction*. The function of the Joshita apparatus is that of a torque limiter to limit slip when receiving excessive torque. Furthermore, as evidenced at least in Fig. 1 of Joshita, the ball screw nut (4) is supported by a bush disposed on an end of the housing (8) so that a radial displacement of the ball screw nut (4) is prevented. Because Joshita fails to disclose or suggest a deformable elastic member that is able to displace in a rotational direction, it cannot anticipate the invention of claim 1. For at least this reason, claim 1 is patentable over Joshita. Claims 2-3, 14, 16, 18, and 19, which depend from claim 1, are similarly patentable over Joshita. Accordingly, withdrawal of this rejection is respectfully requested.

Rejections under 35 U.S.C § 103

Claims 1-3, 14-16, 18 and 19 stand rejected under 35 U.S.C. § 103 as being obvious over U.S. Patent No. 4,754,829, issued to Shimizu ("Shimizu"). Claim 1 has been amended in this reply to clarify the present invention recited. To the extent that this rejection may still apply to the amended claims, it is respectfully traversed.

In contrast to the embodiment of claim 1, as discussed above with respect to the § 102 rejection, Shimizu discloses a power steering system in which the nut 31 is not limited to rotational movement, as required by amended claim 1. Furthermore, in the Shimizu system, the ball screw shaft 3 is supported by a spherical bearing 30 provided in an end of the housing 16 for preventing radial displacement of the ball screw shaft 3.

Therefore, Shimuzu also differs in this respect, because claim 1 requires that the ball screw shaft is supported only by the ball screw nut.

For at least these two reasons, amended claim 1 is patentable over Shimuzu. Claims 2-3, 14, 16, 18, and 19, which depend from claim 1, are similarly patentable over Shimuzu. Accordingly, withdrawal of this rejection is respectfully requested.

Claims 1-3, 14-16, 18 and 19 stand rejected under 35 U.S.C. § 103 as being obvious over U.S. Patent No. 5,590,732, issued to Sugino et al. ("Sugino") in view of U.S. Patent No. 5,921,344, issued to Boyer ("Boyer"). Claim 1 has been amended in this reply to clarify the present invention recited. To the extent that this rejection may still apply to the amended claims, it is respectfully traversed.

In contrast to the embodiment recited in amended claim 1, as discussed above with respect to the § 102 rejection, Sugino discloses a ball screw shaft 3 that is supported by a slide bush 4 provided on an end of the housing 1, so a radial displacement of the ball screw shaft is prevented. Sugino thus fails to disclose or suggest a steering system in which a ball screw shaft is supported only by a ball screw nut, as required by claim 1.

Boyer fails to supply that which Sugino lacks with respect to claim 1. The system according to Boyer differs from the current invention in that the rotor member 82 is restrained at two positions by the bearings 170, 150. In a system according to Boyer, it will be difficult to achieve a smooth rotation of the rotor member 82 as required by a motor. Additionally, there is no bush or other apparatus for supporting the ball screw shaft 14 to the housing 62. Furthermore, because of the configuration of the Boyer system, in which the nut 76 is rigidly supported by the bearings 170, 150 in both the axial

and radial directions, the configuration according to Boyer would not be compatible with a system such as that disclosed by Sugino. Accordingly, the combination of these references is improper.


Thus, Sugino and Boyer, whether considered separately or in combination, fail to disclose or suggest the invention as recited in claim 1. For at least the above reasons, amended claim 1 is patentable over Sugino and Boyer. Claims 2-3, 14, 16, 18, and 19, which depend from claim 1, are similarly patentable over this prior art combination. Furthermore, the combination of these two prior art references is improper, as the two are incompatible with each other. Accordingly, withdrawal of this rejection is respectfully requested.

Conclusion

Applicants believe this reply is fully responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 10122.005001).

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Respectfully submitted,



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